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Grain Research Laboratory

Quality of Western Canadian Wheat 1990

Canada

91-00706/

Quality of Western Canadian Wheat 1990

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Crop Bulletin No. 184
ISSN 0829 - 8718

Prepared for the
Meeting of the Committee on Western Grain Standards
Winnipeg • October 29, 1990

Summary

Following a severe drought last year, ideal weather conditions throughout most of the 1990 growing season resulted in record yields of spring wheat and record production of amber durum wheat. Excellent harvesting conditions produced sound grain of good grade and high falling number.

After two years of very high protein content, values this year are equal to the long-term averages for both Canada Western Red Spring (CWRS) and Canada Western Amber Durum (CWAD) wheat. The mean protein content for 1990 is 13.6% for CWRS and 13.7% for CWAD.

Most quality parameters for CWRS wheat are normal for the grade, with milling performance being particularly good for No. 1 CW samples. Water absorption is significantly higher than in 1989 and baking performance is generally good in all processes. Gluten strength of the durum wheat is very good, as are cooking quality and pasta color.

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Introduction

This bulletin presents detailed information on the quality of the 1990 crop of five classes of Canadian wheat offered on the world market:

Canada Western Red Spring Wheat: a hard wheat with superior milling and baking quality. It is offered at various guaranteed levels of protein content.

Canada Western Amber Durum Wheat: a durum wheat producing a high yield of semolina with excellent pasta-making quality.

Canada Western Red Winter Wheat: a hard wheat suitable for the production of a wide variety of products including French breads, flat breads, steamed breads and certain types of noodles.

Canada Western Utility Wheat: a hard red spring wheat with extra-strong gluten suitable for blending purposes and for the production of hearth and pan breads.

Canada Western Soft White Spring Wheat: a soft wheat of medium-to-low protein content for production of various types of flat breads, noodles, steamed breads, chapattis, cookies, cakes and pastry.

Insufficient samples of **Canada Prairie Spring (CPS)** wheat were received this year for quality analysis of this sixth class. However, two new varieties - an improved red CPS (Biggar) and the first white variety (Genesis) developed for this class - were contract grown in 1990 preparatory to marketing by the Canadian Wheat Board. CPS wheat is semi-hard, with excellent milling quality, medium protein content and medium gluten strength.

It is important to note that data presented in this bulletin are not quality specifications for Canadian wheat. Rather, they represent the best estimate we can obtain in time for the Grain Research Laboratory to report at the end of October to the Committee on Western Grain Standards.

The extent to which the data in this bulletin indicate the exact quality characteristics of wheat of any given grade that will be exported during the coming year depends on a number of factors. These include: the amounts and relative quality of carryover stocks of each grade, and whether the harvest survey composites are, indeed, truly representative of the harvest production.

Statistics Canada *(Field Crop Reporting Series*, No. 7, October 3, 1990) estimates 1990 production of spring wheat in Western Canada at 24.8 million tonnes (from 11.3 million hectares), compared with 18.6 million tonnes (from 10.5 million hectares) in 1989 and the ten-year (1979-88) average of 19.3 million tonnes (from 10.6 million hectares). Normally, over 95% of the spring wheat grown is of the Canada Western Red Spring class - with the Canada Western Utility, Canada Western Soft White Spring and Canada Prairie Spring classes making up the remainder.

Corresponding production estimates for durum wheat are as follows: a record-high 4.3 million tonnes (from 2.2 million hectares) for 1990, 4.1 million tonnes (from a record-high 2.6 million hectares) for 1989 and 2.6 million tonnes (from 1.7 million hectares) for the 10-year averages.

Production of red winter wheat is estimated this year to be 327 thousand tonnes (from 166 thousand hectares) - which is up substantially from last year's production of 224 thousand tonnes (from 119 thousand hectares). However, this is still below the 10-year average production of 434 thousand tonnes (from 242 thousand hectares) for this class of wheat.

Due to widespread rain in the fall of 1989 and a fairly wet spring in 1990, moisture conditions in most areas at seeding were more favorable than springtime conditions in 1988 and 1989. Growing conditions in June were generally good with moderate temperatures which limited heat stress in the drier areas. July weather considerably boosted overall prospects, as rainfall met or exceeded average levels in almost all areas. The month was also cooler than average everywhere except the Peace River region.

At the end of July, prospects for wheat yields were generally promising and August and September weather turned out to be exceptional for filling, ripening and harvesting. The August moisture reserves were sufficient to extend the grain filling period, and with temperatures moderately above normal, most wheat had ripened by the end of the month. Warmer and drier than average conditions prevailed in September

and virtually the entire wheat crop was in the bin by the end of the month. The fine harvest weather meant very little downgrading amongst the various classes of wheat - resulting in well above average quality.

Data from the 1990 protein content survey and from tests on grade composite samples of five classes of wheat are presented in the series of tables, figures and comments which now follow. Table 1 gives mean protein content values for wheat of each class reported. Details regarding the collection of samples and methods used to obtain the data are provided at the end of this bulletin.

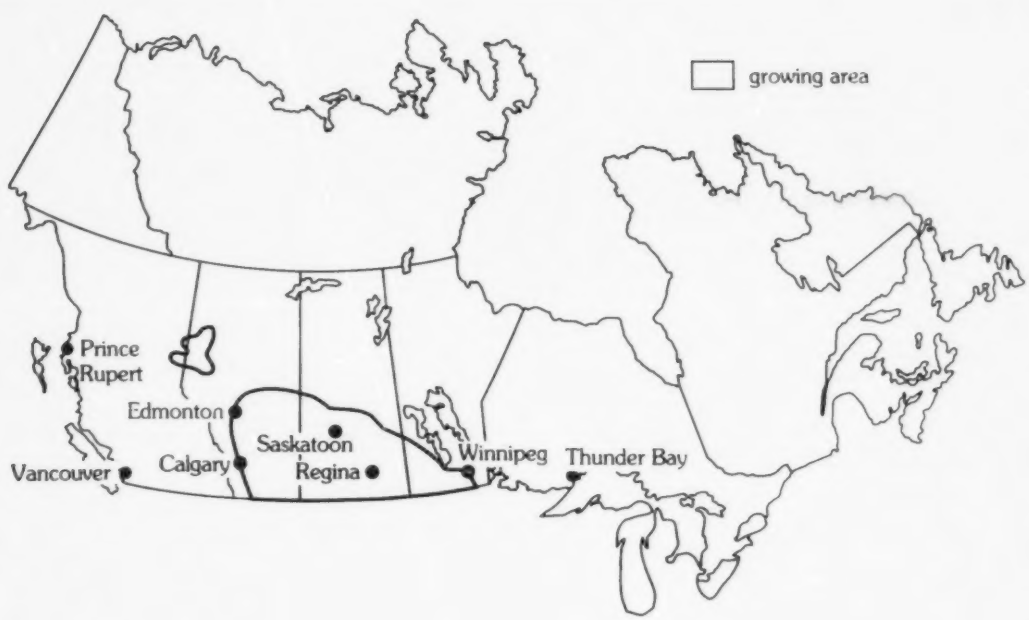
Figure 1 shows the general wheat growing areas in Western Canada.

1. Protein Content of 1990 and 1989 Crop Canada Western (CW) Wheat Classes

Wheat Class	Protein Content*	
	1990	1989
	%	%
CW Red Spring	13.6	14.5
CW Amber Durum	13.7	14.7
CW Red Winter	11.3	11.3
CW Utility	12.7	13.5
CW Soft White Spring	10.9	11.0

* mean value, N x 5.7; 13.5% moisture content basis.

Figure 1. Map of Canada Showing Major Wheat Producing Areas in the Prairies



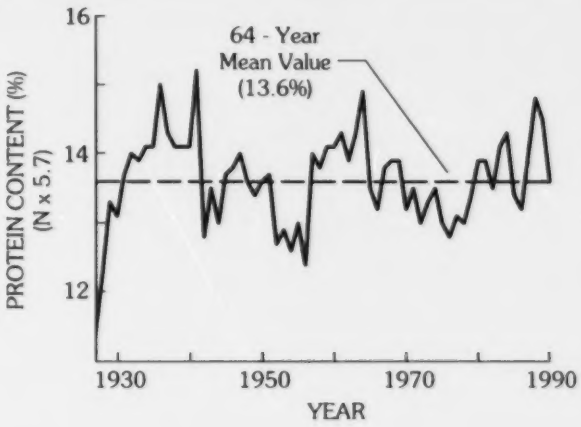
Canada Western Red Spring Wheat

Protein Survey

The average protein content of the 1990 red spring wheat crop is 13.6% - down 0.9 percentage units from 1989 and 0.6 percentage units from the ten-year average for 1980-1989, but equal to the 64-year average since 1927. This mean protein content estimate is based on the 13,287 harvest survey samples tested this year. Annual fluctuation in mean protein content since 1927 is given in Figure 2. Table 2 shows means protein content distributions by province and grade and ten-year means (1980-89) by grade.

Milling grades of this year's crop show a normal drop in protein content with grade from No. 1 CWRS (13.8%) to No. 3 CWRS (13.1%). Little variation between provinces is evident in protein content for the top grades or for all grades combined where the values differ by only 0.1 percentage units.

Figure 2. Mean Protein Content of Harvest Survey Western Canadian Red Spring Wheat 1927 to 1990



2. Protein Content of 1990 Harvest Survey Red Spring Wheat

	Protein Content (%)*					
	Western Canada			1990		
Grade	1990	1989	1980-89	Manitoba	Saskatchewan	Alberta
No. 1 CWRS	13.8	14.9	14.4	13.6	13.8	13.8
No. 2 CWRS	13.3	14.5	14.2	13.1	13.4	13.3
No. 3 CWRS	13.1	14.0	13.9	-	-	-
All Grades	**13.6**	**14.5**	**14.2**	**13.5**	**13.6**	**13.6**

* N x 5.7; 13.5% moisture content basis.

Milling and Baking Quality Data

For quality assessment of the 1990 Canada Western Red Spring (CWRS) wheat crop, composites were prepared from over 13,000 harvest survey samples representing the three milling grades. These composites are divided by region into Eastern and Western Prairie, with each region representing grain which is normally exported through Atlantic and Pacific ports, respectively. The No. 1 and No. 2 grades are further segregated by protein content with minimum levels of 12.5%, 13.5% and 14.5% (13.5% moisture basis). Insufficient sample was available to carry out quality analysis for the Western Prairie No. 2 CWRS-14.5 protein segregate.

No. 1 Canada Western Red Spring Wheat

Quality data for the No. 1 CWRS composites are given in Tables 3 to 6. Test weight and kernel weight are higher than last year. All composites show low levels of alpha-amylase activity and correspondingly high values for wheat falling number and flour amylograph peak viscosity. Wheat ash content is generally lower than for previous crops.

Milling quality is excellent, particularly for Eastern Prairie composites which gave higher yields of flour of similar ash content and color compared with last year. Milling performance of Western Prairie composites is similar to that of the 1989 crop. Additional pilot milling information for No. 1 CWRS wheat is presented on pages 12 and 13.

Farinograph absorptions are similar to long term average values and higher than in 1989. Dough strength properties are within the range normally expected for top grade CWRS wheat flour.

Baking results for this year's No. 1 grade show high loaf volume per unit of flour protein and very good crumb and crust characteristics. Baking absorption is higher than in 1989 and similar to averages for previous years. The oxidation requirement of this year's crop appears to be lower than that of the 1989 crop.

No. 2 Canada Western Red Spring Wheat

Quality characteristics for the No. 2 CWRS composites are shown in Tables 9 and 10. Wheat falling number and flour amylograph peak viscosity values of the Eastern Prairie composites are similar to those of 1989 while values for the Western Prairie composites are considerably higher.

Flour yield is similar to last year for Western Prairie composites and higher for Eastern Prairie composites. Flour color values are better.

Physical dough properties are within the range normally expected for higher grade CWRS wheat flour. Farinograph absorption values are considerably higher than those of last year.

Baking results are very good with high loaf volume per unit protein content and high scores for crumb and crust characteristics. Absorption is higher than in 1989.

No. 3 Canada Western Red Spring Wheat

Tables 11 and 12 provide quality data for No. 3 CWRS Eastern and Western Prairie composites. Wheat and flour protein content are lower than in 1989 but are similar to long term averages. Test weight is similar to last year. In contrast to 1989, both No. 3 CWRS composites show higher wheat falling number and flour amylograph peak viscosity. However, due to the relatively lower proportion of No. 3 CWRS in 1990, it may be some time before shipments of this grade show a significant increase in Falling Number.

The overall milling quality appears superior to that of previous years. Both composites show higher flour yield and lower flour color values than normal.

Dough properties appear to be somewhat stronger (larger extensigraph area) when compared with long term averages. Baking performance for both composites is good.

3. NO. 1 CANADA WESTERN RED SPRING WHEAT
Quality Data for 1990 Eastern Prairie Harvest Survey Grade Composite Samples

Quality Parameter	Minimum Protein Level			No. 1 CW 13.5	
	14.5	13.5	12.5	1989	Mean*
WHEAT					
Test Weight, kg/hL	81.0	82.0	81.9	80.6	81.3
Weight per 1000 Kernels, g	32.1	32.3	33.4	28.6	30.0
Protein Content, % (N x 5.7)	14.6	13.8	12.8	14.0	13.7
Ash Content, %	1.40	1.37	1.51	1.57	1.59
Alpha-amylase Activity, units/g	3.7	4.4	4.0	3.6	3.7
Falling Number, s	405	400	425	410	405
Particle Size Index, %	53.6	51.1	51.3	49.8	-
MILLING					
Flour Yield					
Clean Wheat Basis, %	76.0	76.0	75.7	74.0	75.3
0.50% Ash Basis, %	76.5	77.0	76.2	74.5	76.6
-0.3 Flour Color Grade Basis, %	77.5	77.8	78.1	75.5	76.4
FLOUR					
Protein Content, %	14.3	13.4	12.3	13.1	13.2
Wet Gluten Content, %	43.0	39.7	36.0	40.1	39.3
Ash Content, %	0.49	0.48	0.49	0.49	0.48
Color, units	-0.8	-0.9	-1.1	-0.8	-0.7
Starch Damage, Farrand units	31	31	36	32	31
Alpha-amylase Activity, units/g	0.8	1.0	1.0	1.4	0.8
Amylograph Peak Viscosity, BU	735	720	715	705	735
Maltose Value, g/100 g	1.9	2.0	2.2	2.0	2.0
BAKING (Remix Method)					
Absorption, %	66	64	63	64	65
Loaf Volume, cm^3	940	835	765	850	880
Appearance	8.2	8.0	7.8	8.2	8.2
Crumb Structure	7.0-o	6.8-o	7.0-o	7.0-o	6.9-o
Crumb Color	6.5-d	6.0-d	5.8-d	5.8-d	6.1-dy
FARINOGRAM					
Absorption, %	65.9	65.2	64.5	63.8	64.8
Development Time, min	5.25	4.50	4.00	4.25	4.50
Mixing Tolerance Index, BU	30	30	25	25	30
Stability, min	10.50	9.50	8.50	9.00	8.00
EXTENSIGRAM					
Length, cm	24	23	22	22	22
Height at 5 cm, BU	280	270	290	290	260
Maximum Height, BU	475	450	485	490	425
Area, cm^2	150	145	140	145	130
ALVEOGRAM					
Length, mm	145	142	111	141	121
P (height x 1.1), mm	90	91	103	96	96
W, x 10^3 ergs	405	402	371	433	381

* 10-yr period 1979 to 1988, except Maltose Value (6-yr mean) and Mixing Tolerance Index and Stability (4-yr means)

4. NO. 1 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data · 1990 Eastern Prairie Harvest Survey Grade Composite Samples

Quality Parameter	Minimum Protein Level			1989
	14.5	13.5	12.5	No. 1 CW 13.5
SPONGE-AND-DOUGH METHOD				
Potassium Bromate, ppm	20	20	20	20
Absorption, %	68	67	67	65
Mixing[1]: energy, Whr/kg	3.2	3.1	3.3	4.0
Mixing[1]: time, min	4.8	4.6	4.8	4.7
Loaf Volume, cm^3/100 g flour	1 208	1 155	1 085	1 120
Yield: bread wt/flour wt	1.44	1.45	1.45	1.43
Appearance	7.5	7.7	7.5	8.3
Crumb Structure	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	7.9	7.7	7.7	8.2
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37 5/30
Absorption, %	70	69	69	67
Mixing: energy, Whr/kg	6.8	7.8	7.4	8.1
Mixing: time, min	7.2	8.4	8.5	7.8
Loaf Volume, cm^3/100 g flour	1 250	1 210	1 140	1 073
Yield: bread wt/flour wt	1.55	1.53	1.53	1.53
Appearance	8.2-v sl o[2]	7.5-v sl o[2]	7.8-v sl o[2]	7.9
Crumb Structure	6.8-o	6.8-o	6.5-o	6.7-o
Crumb Color	8.2	8.0	8.0	8.0

[1] dough stage
[2] v sl o - very slightly old

5. NO. 1 CANADA WESTERN RED SPRING WHEAT
Quality Data for 1990 Western Prairie Harvest Survey Grade Composite Samples

Quality Parameter	Minimum Protein Level			No. 1 CW 13.5	
	14.5	13.5	12.5	1989	Mean*
WHEAT					
Test Weight, kg/hL	81.9	81.3	82.1	80.6	81.6
Weight per 1000 Kernels, g	32.1	32.0	32.0	28.8	30.6
Protein Content, % (N x 5.7)	14.6	13.7	12.8	13.9	13.7
Ash Content, %	1.56	1.49	1.34	1.52	1.54
Alpha-amylase Activity, units/g	3.6	4.4	4.8	3.4	3.9
Falling Number, s	390	390	385	410	390
Particle Size Index, %	51.0	52.2	48.3	51.1	-
MILLING					
Flour Yield					
Clean Wheat Basis, %	75.7	75.2	75.5	75.3	75.4
0.50% Ash Basis, %	76.7	75.7	76.0	76.8	76.9
-0.3 Flour Color Grade Basis, %	77.5	77.3	78.5	76.8	76.6
FLOUR					
Protein Content, %	14.0	12.9	12.0	13.3	13.2
Wet Gluten Content, %	43.5	39.3	35.5	39.4	39.2
Ash Content, %	0.48	0.49	0.49	0.47	0.47
Color, units	-0.9	-1.0	-1.3	-0.8	-0.7
Starch Damage, Farrand units	33	34	37	31	32
Alpha-amylase Activity, units/g	1.1	1.4	1.3	1.1	1.0
Amylograph Peak Viscosity, BU	730	690	680	745	685
Maltose Value, g/100 g	2.0	2.1	2.2	1.9	2.0
BAKING (Remix Method)					
Absorption, %	66	64	63	64	65
Loaf Volume, cm^3	900	830	755	890	870
Appearance	8.0	8.2	7.8	8.2	8.1
Crumb Structure	7.0-o	6.8-o	7.0-o	6.8-o	6.9-o
Crumb Color	6.5-d	6.0-d	5.8-d	6.0-d	6.1-dy
FARINOGRAM					
Absorption, %	66.1	65.4	64.9	63.9	65.4
Development Time, min	5.00	4.50	3.75	4.75	4.75
Mixing Tolerance Index, BU	30	30	30	25	30
Stability, min	10.00	9.50	7.00	11.00	7.75
EXTENSIGRAM					
Length, cm	21	23	22	22	22
Height at 5 cm, BU	285	285	285	290	260
Maximum Height, BU	475	460	460	485	415
Area, cm^2	135	145	135	145	125
ALVEOGRAM					
Length, mm	132	117	103	135	116
P (height x 1.1), mm	96	104	108	95	99
W, x 10^3 ergs	408	397	375	418	383

* 10-yr period 1979 to 1988, except Maltose Value (6-yr mean) and Mixing Tolerance Index and Stability (4-yr means)

6. NO. 1 CANADA WESTERN RED SPRING WHEAT
Supplementary Baking Data · 1990 Western Prairie Harvest Survey Grade Composite Samples

Quality Parameter	Minimum Protein Level			1989
	14.5	13.5	12.5	No. 1 CW 13.5
SPONGE-AND-DOUGH METHOD				
Potassium Bromate, ppm	20	20	20	20
Absorption, %	68	67	67	65
Mixing[1]: energy, Whr/kg	2.9	3.0	2.9	3.9
Mixing[1] time, min	3.9	4.1	4.5	4.6
Loaf Volume, cm^3/100 g flour	1 225	1 200	1 053	1 133
Yield: bread wt/flour wt	1.44	1.44	1.45	1.43
Appearance	8.4-v sl o[2]	8.5-sl o	7.5-sl o	8.3
Crumb Structure	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	8.1	7.9	7.8	8.1
CANADIAN SHORT PROCESS				
Ascorbic Acid/Bromate, ppm	37.5/30	37.5/30	37.5/30	37.5/30
Absorption, %	70	69	69	67
Mixing: energy, Whr/kg	5.8	6.5	6.7	8.9
Mixing: time, min	6.8	7.2	8.0	8.6
Loaf Volume, cm^3/100 g flour	1 205	1 145	1 065	1 090
Yield: bread wt/flour wt	1.54	1.53	1.55	1.53
Appearance	7.8-v sl o[2]	7.8-v sl o[2]	7.8	8.1
Crumb Structure	6.8-o	6.8-o	6.8-o	6.8-o
Crumb Color	8.0	8.0	8.0	8.0

[1] dough stage
[2] v sl o - very slightly old

GRL Pilot Mill Data

Samples of 1990 and 1989 harvest survey No. 1 CWRS 13.5 wheat, both Eastern Prairie and Western Prairie, were milled consecutively in duplicate with the GRL pilot mill to complement laboratory-scale testing. Cumulative ash curves (Figure 3) were computed from the yield and ash content of individual millstreams from each milling. A straight-grade flour, a high quality patent flour (prime quality reduction streams representing 60% of total flour) and a second patent flour (better quality break flours and middle reduction streams representing the next 30% of total flour) were prepared to allow comparison of flour properties in a commercially relevant fashion (Tables 7 and 8). Data from pilot milling confirm the trends apparent from laboratory-scale test results.

Eastern Prairie Samples

The 1990 sample exhibited higher intrinsic flour yield, lower flour ash content and brighter flour color grade than the 1989 sample (Table 7). As seen from the cumulative ash curves (Figure 3) and the divide flour data (Table 7), the improvement in ash content and flour color grade was apparent throughout the complete extraction range. Therefore, enhanced milling value, compared with 1989, should be realized this year for the No. 1 CWRS grade.

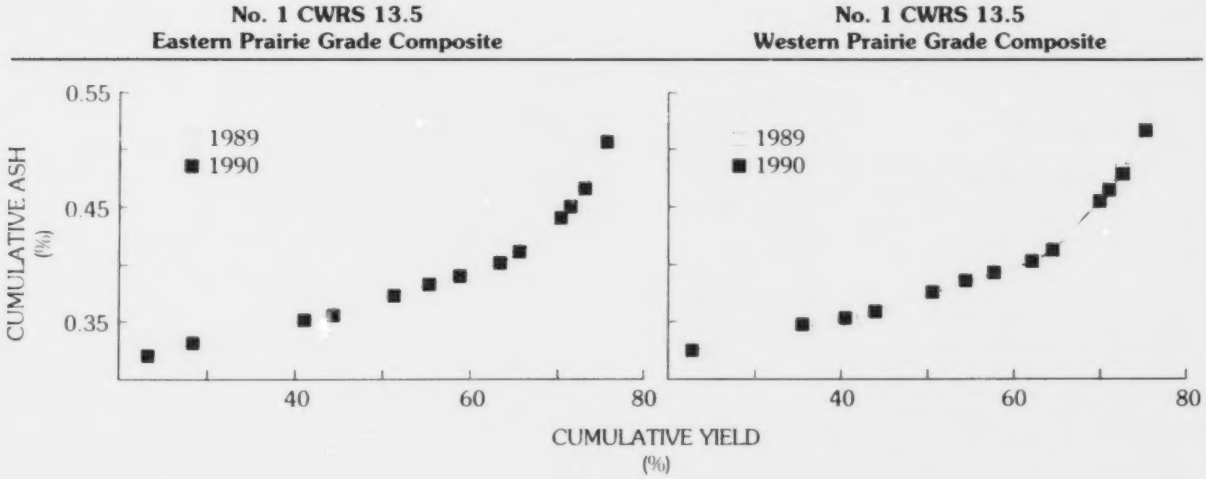
There was little difference in flour starch damage between the two samples. However, there was a significant increase in farinogragh absorption for all the 1990 divide flour samples over the corresponding 1989 samples. Farinogragh gluten strength indicators were comparable for both years.

Western Prairie Samples

Test results show little difference in intrinsic flour yield and flour ash content between the 1990 and 1989 samples (Table 8). The cumulative ash curves (Figure 3) were also similar. However, all divide flour samples for 1990 exhibited a significant improvement in flour color grade compared with 1989 samples. (Table 8).

There was no difference in flour starch damage shown between the two years, but the 1990 divide flour samples all had significantly higher farinogragh absorption values (Table 8). Although dough development time and stability were somewhat shorter in most cases, the 1990 divide flour samples exhibited good strength based on farinogram properties.

Figure 3. Cumulative Ash Curves for Pilot Millings



7. NO. 1 CANADA WESTERN 13.5 RED SPRING WHEAT
Pilot Mill Flour Data • 1990 Eastern Prairie Harvest Survey Grade Composite Samples

	Straight-grade		First Patent		Second Patent	
Quality Parameter	1990	1989	1990	1989	1990	1989
FLOUR						
Flour Yield, %	75.8	75.2	45.5	45.1	22.7	22.6
Protein Content, %	13.7	13.8	12.5	12.6	14.9	15.2
Ash Content, %	0.51	0.53	0.36	0.37	0.56	0.60
Color, units	0.4	1.0	-2.5	-2.2	1.2	1.8
Starch Damage, Farrand units	26	26	26	25	27	28
FARINOGRAM						
Absorption, %	64.4	63.0	62.7	61.2	66.0	65.4
Development Time, min	4.75	4.50	4.75	4.25	5.25	5.25
Mixing Tolerance Index, BU	40	35	20	20	30	30
Stability, min	8.00	9.50	22.50	24.00	10.00	9.50

8. NO. 1 CANADA WESTERN 13.5 RED SPRING WHEAT
Pilot Mill Flour Data • 1990 Western Prairie Harvest Survey Grade Composite Samples

	Straight-grade		First Patent		Second Patent	
Quality Parameter	1990	1989	1990	1989	1990	1989
FLOUR						
Flour Yield, %	75.4	75.3	45.2	45.2	22.6	22.6
Protein Content, %	13.2	13.5	12.2	12.3	14.6	14.9
Ash Content, %	0.52	0.52	0.37	0.36	0.61	0.60
Color, units	0.5	0.7	-2.8	-2.4	1.5	1.9
Starch Damage, Farrand units	29	28	28	27	28	30
FARINOGRAM						
Absorption, %	64.2	63.2	62.6	60.9	66.0	65.4
Development Time, min	4.50	5.0	4.75	4.00	5.25	5.25
Mixing Tolerance Index, BU	35	30	20	15	30	25
Stability, min	9.00	10.00	20.00	37.50	9.50	10.00

9. NO. 2 CANADA WESTERN RED SPRING WHEAT
Quality Data for 1990 Eastern Prairie Harvest Survey Grade Composite Samples

Quality Parameter	Minimum Protein Level		No. 2 CW 13.5	
	13.5	12.5	1989	Mean*
WHEAT				
Test Weight, kg/hL	79.2	80.1	78.1	79.8
Weight per 1000 Kernels, g	32.7	32.1	29.6	30.6
Protein Content, % (N x 5.7)	13.8	12.7	13.8	13.7
Ash Content, %	1.54	1.41	1.54	1.61
Alpha-amylase Activity, units/g	6.0	7.6	11.7	5.2
Falling Number, s	385	390	355	395
Particle Size Index, %	51.9	51.3	55.2	-
MILLING				
Flour Yield				
Clean Wheat Basis, %	75.3	75.3	75.2	74.8
0.50% Ash Basis, %	76.3	75.8	76.2	75.6
-0.3 Flour Color Grade Basis, %	77.4	78.3	76.7	75.1
FLOUR				
Protein Content, %	13.2	12.0	13.1	13.1
Wet Gluten Content, %	39.0	35.1	39.9	38.8
Ash Content, %	0.48	0.49	0.48	0.48
Color, units	-1.0	-1.3	-0.8	-0.4
Starch Damage, Farrand units	32	30	28	29
Alpha-amylase Activity, units/g	3.1	2.2	2.8	1.7
Amylograph Peak Viscosity, BU	520	580	555	625
Maltose Value, g/100 g	2.1	2.0	1.8	1.9
BAKING (Remix Method)				
Absorption, %	64	63	64	64
Loaf Volume, cm^3	830	770	870	880
Appearance	8.0	7.8	8.2	8.1
Crumb Structure	7.0-o	7.0-o	7.0-o	6.8-o
Crumb Color	6.0-d	6.0-d	6.0-d	6.2-dy
FARINOGRAM				
Absorption, %	65.0	64.2	63.4	64.3
Development Time, min	4.50	3.75	4.50	4.50
Mixing Tolerance Index, BU	30	35	30	35
Stability, min	7.50	8.50	9.00	7.75
EXTENSIGRAM				
Length, cm	23	21	21	22
Height at 5 cm, BU	275	290	295	255
Maximum Height, BU	465	435	495	410
Area, cm^2	140	125	140	125
ALVEOGRAM				
Length, mm	123	107	131	121
P (height x 1.1), mm	97	107	91	92
W, x 10^3 ergs	377	366	381	364

* 10-yr period 1979 to 1988, except Maltose Value (6-yr mean) and Mixing Tolerance Index and Stablilty (4-yr means)

10. NO. 2 CANADA WESTERN RED SPRING WHEAT

Quality Data for 1990 Western Prairie Harvest Survey Grade Composite Samples

Quality Parameter	Minimum Protein Level		No. 2 CW 13.5	
	13.5	12.5	1989	Mean*
WHEAT				
Test Weight, kg/hL	79.6	79.8	79.1	80.2
Weight per 1000 Kernels, g	31.5	31.5	31.3	31.2
Protein Content, % (N x 5.7)	13.6	12.6	13.7	13.7
Ash Content, %	1.56	1.45	1.49	1.55
Alpha-amylase Activity, units/g	11.5	9.6	19.4	6.0
Falling Number, s	360	375	325	375
Particle Size Index, %	51.1	49.8	51.4	-
MILLING				
Flour Yield				
Clean Wheat Basis, %	75.5	75.5	75.3	75.0
0.50% Ash Basis, %	75.5	75.0	76.8	75.8
-0.3 Flour Color Grade Basis, %	77.0	77.3	76.8	75.1
FLOUR				
Protein Content, %	13.1	12.2	13.0	13.2
Wet Gluten Content, %	41.2	36.4	37.6	39.0
Ash Content, %	0.50	0.51	0.47	0.48
Color, units	-0.8	-0.9	-0.8	-0.4
Starch Damage, Farrand units	34	37	31	31
Alpha-amylase Activity, units/g	2.6	3.1	6.4	2.2
Amylograph Peak Viscosity, BU	565	540	315	555
Maltose Value, g/100 g	2.2	2.3	2.2	2.0
BAKING (Remix Method)				
Absorption, %	64	63	64	65
Loaf Volume, cm^3	820	745	870	875
Appearance	8.0	7.5	8.2	7.9
Crumb Structure	6.8-o	7.0-o	6.8-o	6.8-o
Crumb Color	6.0-d	5.8-d	6.0-d	6.2-dy
FARINOGRAM				
Absorption, %	65.7	65.5	63.8	65.5
Development Time, min	4.25	3.75	4.50	4.50
Mixing Tolerance Index, BU	35	40	35	30
Stability, min	8.00	7.00	7.50	7.75
EXTENSIGRAM				
Length, cm	23	22	23	21
Height at 5 cm, BU	245	260	290	250
Maximum Height, BU	395	415	465	380
Area, cm^2	120	125	150	115
ALVEOGRAM				
Length, mm	132	104	134	115
P (height x 1.1), mm	94	106	93	98
W, x 10^3 ergs	370	347	400	360

* 10-yr period 1979 to 1988, except Maltose Value (6-yr mean) and Mixing Tolerance Index and Stability (4-yr means)

11. NO. 3 CANADA WESTERN RED SPRING WHEAT
Quality Data for 1990 Eastern Prairie Harvest Survey Grade Composite Samples

Quality Parameter	1990	1989	Mean*
WHEAT			
Test Weight, kg/hL	78.2	77.6	78.2
Weight per 1000 Kernels, g	32.8	29.2	30.6
Protein Content, % (N x 5.7)	13.1	14.2	13.6
Ash Content, %	1.59	1.49	1.61
Alpha-amylase Activity, units/g	18.8	60.9	20.5
Falling Number, s	325	230	325
Particle Size Index, %	51.2	51.4	-
MILLING			
Flour Yield			
Clean Wheat Basis, %	75.1	75.4	74.2
0.50% Ash Basis, %	75.6	76.9	74.5
-0.3 Flour Color Grade Basis, %	76.6	73.6	72.8
FLOUR			
Protein Content, %	12.4	13.3	13.0
Wet Gluten Content, %	36.3	38.9	38.0
Ash Content, %	0.49	0.47	0.49
Color, units	-0.8	0.3	0.2
Starch Damage, Farrand units	33	30	29
Alpha-amylase Activity, units/g	6.4	32.6	6.2
Amylograph Peak Viscosity, BU	265	85	315
Maltose Value, g/100 g	2.3	3.1	2.3
BAKING (Remix Method)			
Absorption, %	63	63	64
Loaf Volume, cm^3	785	915	870
Appearance	7.5	8.5	8.0
Crumb Structure	6.8-o	6.5-o	6.8-o
Crumb Color	6.0-d	6.0-d	6.1-d
FARINOGRAM			
Absorption, %	64.2	63.7	64.4
Development Time, min	3.75	3.75	4.25
Mixing Tolerance Index, BU	30	45	40
Stability, min	7.50	6.50	6.50
EXTENSIGRAM			
Length, cm	23	23	22
Height at 5 cm, BU	260	250	245
Maximum Height, BU	415	415	385
Area, cm^2	130	130	120
ALVEOGRAM			
Length, mm	114	140	116
P (height x 1.1), mm	90	89	98
W, x 10^3 ergs	328	382	364

* 10-yr period 1979 to 1988, except Maltose Value (6-yr mean) and Mixing Tolerance Index and Stability (4-yr means)

12. NO. 3 CANADA WESTERN RED SPRING WHEAT
Quality Data for 1990 Western Prairie Harvest Survey Grade Composite Samples

Quality Parameter	1990	1989	Mean*
WHEAT			
Test Weight, kg/hL	78.9	78.5	79.1
Weight per 1000 Kernels, g	32.3	30.4	31.5
Protein Content, % (N x 5.7)	13.2	13.9	13.2
Ash Content, %	1.58	1.56	1.59
Alpha-amylase Activity, units/g	15.1	93.2	22.3
Falling Number, s	335	195	295
Particle Size Index, %	50.3	50.5	-
MILLING			
Flour Yield			
Clean Wheat Basis, %	75.0	75.6	74.5
0.50% Ash Basis, %	75.0	76.6	74.2
-0.3 Flour Color Grade Basis, %	75.3	73.5	73.1
FLOUR			
Protein Content, %	12.6	13.2	12.5
Wet Gluten Content, %	37.1	38.8	36.8
Ash Content, %	0.50	0.48	0.51
Color, units	-0.4	0.4	0.2
Starch Damage, Farrand units	37	28	33
Alpha-amylase Activity, units/g	5.3	43.9	8.4
Amylograph Peak Viscosity, BU	225	80	255
Maltose Value, g/100 g	2.5	3.5	2.7
BAKING (Remix Method)			
Absorption, %	63	63	63
Loaf Volume, cm^3	770	900	805
Appearance	7.5	8.5	7.6
Crumb Structure	6.5-o	6.8-o	6.7-o
Crumb Color	5.5-d	5.8-d	5.3-d
FARINOGRAM			
Absorption, %	66.3	64.5	65.1
Development Time, min	4.00	4.00	3.75
Mixing Tolerance Index, BU	30	55	40
Stability, min	7.50	6.50	6.75
EXTENSIGRAM			
Length, cm	22	25	21
Height at 5 cm, BU	245	230	235
Maximum Height, BU	375	410	350
Area, cm^2	115	140	105
ALVEOGRAM			
Length, mm	100	142	99
P (height x 1.1), mm	101	86	106
W, x 10^3 ergs	325	365	354

* 10-yr period 1979 to 1988, except Maltose Value (6-yr mean) and Mixing Tolerance Index and Stability (4-yr means)

Canada Western Amber Durum Wheat

The record amber durum wheat crop in Western Canada was harvested under good conditions, with the result that the bulk of the crop will qualify for the top grades. Unlike the past several years, there is no single major degrading factor. There were isolated areas where red smudge was a factor; in others, a degree of immaturity was evident; and low vitreous kernel content also was encountered in some samples. Overall, this year's crop may be characterized as generally sound with very little damage.

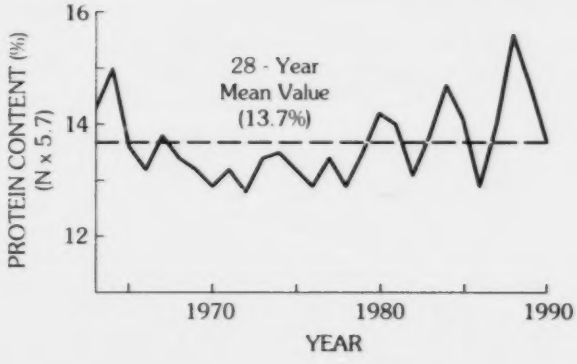
The soundness is reflected in good test weight and larger kernel size (weight per 1000 kernels) which increased to 42.3 g from 38.8 g in 1989 for the mean of all grades. The other major indicator of soundness, falling number, is high for the top grades. Unlike the last two years, sprout damage was not a factor - with only a few of the samples received having some sprouted kernels present. Most of these samples fell into the lower grades, as indicated by the low falling number of 195 for the No. 4 CWAD grade.

Milling yield is approximately the same as last year, but semolina yield is about two percentage units lower. The speck count is somewhat higher in all grades. Protein content is one percentage unit lower than for the 1989 harvest survey, but equal to the long-term average (Figure 4). The level of protein in the top two grades is adequate to give pasta of good cooking quality, and pasta color is also very good. The lower cooking quality parameter for the No. 3 CWAD grade is a reflection of the lower protein content - compared with the top two grades.

Gluten strength as assessed with the SDS sedimentation test and farinograph test is good. Farinograms (not shown) indicate good gluten quality - longer dough development time, wider band width and lower mixing tolerance index.

Based on information available to date, it appears that Kyle will again be the predominant variety grown this year - accounting for more than one-third of the area seeded to durum wheat.

Figure 4. Mean Protein Content of Harvest Survey Western Canadian Amber Durum Wheat 1963 to 1990



13. Protein Content of 1990 Harvest Survey Canada Western Amber Durum Wheat

	Protein Content (%)*					
	Western Canada			1990		
Grade	1990	1989	1981-89	Manitoba	Saskatchewan	Alberta
No. 1 CWAD	14.1	15.1	14.2	13.8	14.3	14.4
No. 2 CWAD	13.7	14.9	14.0	13.7	13.7	14.0
No. 3 CWAD	13.0	14.5	14.1	13.0	13.0	13.5
No. 4 CWAD	12.7	13.9	13.5	13.0	13.0	13.0
All Grades	**13.7**	**14.7**	**14.0**	**13.4**	**13.8**	**14.3**

* N x 5.7; 13.5% moisture content basis.

Durum wheat varieties grown in Western Canada have all been tested for acceptable end-product quality as well as for good agronomic characteristics and disease resistance. The following descriptions outline the features of each registered variety:

Hercules - The statutory standard for amber durum wheat, registered in 1969, was the first of the varieties developed to have better gluten quality and pasta color than the existing varieties of that era.

Wascana - Registered in 1971, it was the first variety with high yellow pigment content resulting in excellent pasta color. Although its gluten quality was marginal, it was the predominant variety from 1973 to 1977.

Wakooma - The first of the varieties with gluten strength better than Hercules was registered in 1973 and predominated from 1978 to 1987 despite having lower yellow pigment content because its stronger gluten resulted in pasta of good cooking quality.

Medora - A variety with good color and gluten quality was developed for the black soil zone and was registered in 1982. It accounted for 21% of the acreage in 1987 but has since declined.

Kyle - Another of the varieties with good color and gluten strength, Kyle was registered in 1984. It replaced Wakooma as the predominant variety in 1988 and likely will be the leading variety for several more years.

Sceptre - A shorter-strawed, early maturing variety exhibiting higher yields was registered in 1985. It has good quality but its protein content tends to be lower than that of other varieties.

Plenty - The latest variety to be registered (1990) is higher yielding - in addition to having good quality characteristics. It may replace some of the current varieties in the next few years.

14. NO. 1 AND NO. 2 CANADA WESTERN AMBER DURUM WHEAT
Quality Data for 1990 Harvest Survey Grade Composite Samples

Quality Parameter	1990		1989	
	No. 1 CWAD	No. 2 CWAD	No. 1 CWAD	No. 2 CWAD
WHEAT				
Test Weight, kg/hL	81.4	80.9	81.0	79.9
Weight per 1000 Kernels, g	42.8	42.0	37.7	38.0
Vitreous Kernels, %	92	86	90	81
Protein Content, %	14.1	13.7	15.0	14.8
Ash Content, %	1.53	1.58	1.52	1.67
SDS Sedimentation, mL	43	40	45	44
Falling Number, s	385	355	430	320
Alpha-amylase Activity, units/g	5.5	12.4	-	-
Milling Yield, %	75.9	74.9	75.5	75.7
Semolina Yield, %	63.8	63.2	65.7	65.5
SEMOLINA				
Protein Content, %	13.3	12.8	14.3	14.3
Wet Gluten Content, %	35.6	34.5	36.9	37.6
Ash Content, %	0.69	0.70	0.71	0.71
AGTRON Color, units	74	75	67	67
Speck Count per 50 cm^2	23	25	14	19
Alpha-amylase Activity, units/g	2.1	7.9	-	-
SPAGHETTI				
Dried at 70°C				
Color:				
Brightness, %	49.7	50.1	47.8	48.0
Purity, %	50.2	50.2	51.4	50.7
Dominant Wavelength, nm	576.9	577.0	577.3	577.2
Cooking Quality, CQP	55.9	59.3	57.3	48.4
Stickiness, N/m^2	980	850	670	720
Cooking Loss, %	5.7	5.7	5.4	5.0

15. NO. 3 AND NO. 4 CANADA WESTERN AMBER DURUM WHEAT
Quality Data for 1990 Harvest Survey Grade Composite Samples

Quality Parameter	1990		1989	
	No. 3 CWAD	No. 4 CWAD	No. 3 CWAD	No. 4 CWAD
WHEAT				
Test Weight, kg/hL	80.0	79.0	79.4	78.4
Weight per 1000 Kernels, g	42.3	42.0	39.6	39.8
Vitreous Kernels, %	76	69	62	48
Protein Content, %	13.0	12.7	14.6	13.9
Ash Content, %	1.63	1.65	1.60	1.57
SDS Sedimentation, mL	40	41	40	40
Falling Number, s	285	195	220	125
Alpha-amylase Activity, units/g	42.6	124.8	-	-
Milling Yield, %	75.3	74.8	75.9	75.1
Semolina Yield, %	63.2	62.4	65.4	64.9
SEMOLINA				
Protein Content, %	12.3	12.0	13.9	13.2
Wet Gluten Content, %	33.3	32.5	36.9	34.6
Ash Content, %	0.68	0.70	0.72	0.70
AGTRON Color, units	73	72	68	68
Speck Count per 50 cm^2	32	51	24	26
Alpha-amylase Acivitity, units/g	17.0	49.0	-	-
SPAGHETTI				
Dried at 70°C				
Color:				
Brightness, %	49.4	49.1	48.7	49.0
Purity, %	50.1	50.3	50.2	50.4
Dominant Wavelength, nm	577.0	577.2	577.1	577.0
Cooking Quality, CQP	39.3	45.9	61.5	46.8
Stickiness, N/m^2	850	870	710	770
Cooking Loss, %	6.1	6.0	5.5	5.3

Canada Western Red Winter Wheat

Canada Western Red Winter (CWRW) wheat has excellent milling quality. Flour produced from high grade CWRW wheat performs well in the production of hearth breads and certain types of noodles, and is also suitable for the production of various types of flat bread, steamed bread and related products.

The variety Norstar continues to account for the major portion of the area seeded to CWRW wheat, with Norwin also being grown.

As indicated in Table 16, the average protein content of 11.3% (13.5% moisture basis) for this year's crop is the same as last year - with the No. 1 grade showing the highest protein content (11.7%) of the three milling grades. The 1990 harvest survey included 587 samples.

Quality data of composites representing the top three grades of CWRW wheat, as well as comparative data from 1989, are provided in Table 17. Test weight for the No. 1 grade is similar, and for the No. 2 and No. 3 grades is lower compared with corresponding 1989 values. The same trend is evident with kernel weight. The high wheat falling number and flour amylograph peak viscosity values of the top grades are consistent with the low levels of alpha-amylase activity present. The No. 3 grade shows superior values to last year.

All three grades exhibit excellent milling quality, with high flour yield and very low flour ash and flour color values. This year's crop has similar physical dough properties to last year, and farinograph and baking absorption values are somewhat higher. High loaf volume per unit protein and good bread characteristics were obtained with the Remix baking procedure.

16. Protein Content of 1990 Harvest Survey Canada Western Red Winter Wheat

	Protein Content (%)*	
Grade	1990	1989
No. 1 CWRW	11.7	12.0
No. 2 CWRW	10.9	10.2
No. 3 CWRW	9.9	9.7
All Grades	**11.3**	**11.3**

* N x 5.7; 13.5% moisture content basis.

17. CANADA WESTERN RED WINTER WHEAT
Quality Data for 1990 Harvest Survey Grade Composite Samples

Quality Parameter	1990			1989	
	No. 1 CW	No. 2 CW	No. 3 CW	No. 1 CW	No. 2 CW
WHEAT					
Test Weight, kg/hL	82.0	80.8	80.1	82.1	82.1
Weight per 1000 Kernels, g	30.0	29.3	30.6	30.1	30.6
Protein Content, % (N x 5.7)	11.7	10.9	9.9	11.9	10.5
Ash Content, %	1.31	1.50	1.48	1.44	1.52
Alpha-amylase Activity, units/g	8.3	14.1	38.7	4.4	7.9
Falling Number, s	370	325	270	360	350
Particle Size Index, %	52.6	56.5	57.6	55.0	56.3
Flour Yield, %	75.8	75.2	75.4	75.8	76.1
FLOUR					
Protein Content, %	11.2	10.3	9.0	11.2	9.8
Wet Gluten Content, %	32.2	30.0	25.2	31.7	27.1
Ash Content, %	0.44	0.46	0.44	0.44	0.45
Color, units	-1.4	-1.5	-2.1	-1.4	-1.8
Starch Damage, Farrand units	24	21	22	22	23
Alpha-amylase Activity, units/g	3.0	4.2	11.4	1.7	2.4
Amylograph Peak Viscosity, BU	475	420	155	600	545
Maltose Value, g/100 g	1.8	1.7	2.1	1.8	1.7
BAKING (Remix Method)					
Absorption, %	58	56	55	58	54
Loaf Volume, cm^3	745	695	650	795	685
Appearance	8.0	7.8	7.5	8.5	7.8
Crumb Structure	7.0-o	6.8-o	6.5-o	7.0-o	6.5
Crumb Color	6.5-d	5.8-d	5.2-d	5.8-d	5.2-d
FARINOGRAM					
Absorption, %	57.6	56.1	54.6	57.0	55.2
Development Time, min	5.25	4.50	1.75	5.75	4.00
Mixing Tolerance Index, BU	40	45	40	45	35
Stability, min	9.50	8.50	6.50	10.00	8.50
EXTENSIGRAM					
Length, cm	23	23	21	21	22
Height at 5 cm, BU	295	260	250	305	295
Maximum Height, BU	545	455	400	560	490
Area, cm^2	165	140	115	150	145
ALVEOGRAM					
Length, mm	156	172	146	161	156
P (height x 1.1), mm	62	50	48	57	52
W, x 10^3 ergs	313	252	202	294	259

Canada Western Utility Wheat

Canada Western Utility (CWU) wheat is characterized by its hard kernel texture and very strong physical dough properties. This wheat is excellent for blending purposes and can also be used for the production of pan breads, hearth breads and common wheat pasta products. The predominant variety entering this class for 1990 was once again Glenlea.

Protein content for this year's crop averaged 12.7% - based upon 117 survey samples.

Quality data for the No. 1 CWU grade composite are shown in Table 18. Insufficient samples were available to prepare a No. 2 grade composite. High wheat falling number and flour amylogragh peak viscosity values are consistent with the low levels of alpha-amylase, indicating very sound kernels. Milling properties show the high flour yield and higher ash content typical of this class of wheat. Flour color is very good and the high starch damage is consistent with the hard kernel texture of CWU wheat.

Due to very strong properties, dough made from CWU wheat flour cannot be properly developed at the normal farinogragh speed of 64 rpm. When operated at 90 rpm, the farinogragh showed consistency maxima at 1.25 and 10.00 minutes. The remix- to-peak baking results show the very good baking quality that can be attained when sufficient mixing and fermentation is imparted to obtain optimum dough development.

18. CANADA WESTERN UTILITY WHEAT
Quality Data for 1990 Harvest Survey Grade Composite Sample

Quality Parameter	No. 1 CW Utility
WHEAT	
Test Weight, kg/hL	78.8
Weight per 1000 Kernels, g	39.1
Protein Content, % (N x 5.7)	12.7
Ash Content, %	1.58
Alpha-amylase Activity, units/g	6.7
Falling Number, s	365
Particle Size Index, %	43.5
Flour Yield, %	75.9
FLOUR	
Protein Content, %	12.1
Wet Gluten Content, %	30.5
Ash Content, %	0.57
Color, units	-0.5
Starch Damage, Farrand units	40
Alpha-amylase Activity, units/g	2.3
Amylograph Peak Viscosity, BU	605
Maltose Value, g/100 g	2.6
BAKING (Remix-to-Peak Method)	
Absorption, %	63
Remix time, min	4.2
Loaf Volume, cm^3	795
Appearance	8.2
Crumb Structure	7.0-o
Crumb Color	7.8
FARINOGRAM	
Absorption, %	62.1
Development Time (90 rpm), min	10.00
EXTENSIGRAM	
Length, cm	25
Height at 5 cm, BU	360
Maximum Height, BU	715
Area, cm^2	245
ALVEOGRAM	
Length, mm	111
P (height x 1.1), mm	120
W, x 10^{-4} ergs	525

Canada Western Soft White Spring Wheat

Canada Western Soft White Spring (CWSWS) wheat is a lower protein, soft wheat with weak dough properties. Flours milled from this wheat are suitable for the production of cookies, cakes, biscuits and related products. They can also be used alone or in blends with stronger wheat flours for the production of crackers, French baguettes, flat breads and certain types of noodles.

CWSWS wheat is grown under irrigation to maximize yield and minimize protein content. The Alberta Wheat Pool estimates this year's production to be 365 thousand tonnes, up from the 1989 production of 309 thousand tonnes - due mainly to a 14.5% increase in seeded area but also to an increase in yield of 3%. The predominant variety was again Fielder, with a small amount of Owens also grown.

Mean overall protein content for 1990 is 10.9% - down slightly from 1989 and 1988 (Table 19). A total of 288 samples were received for testing this year.

Quality data for the top two grade composites and comparative results for 1989 are provided in Table 20. Test weight, falling number and flour yield are higher this year, while wet gluten content is lower. Although particle size index values are a little lower, indicating slightly harder kernel characteristics this year, there was little change in related flour parameters such as starch damage and maltose value. Amylogragh peak viscosity values are substantially higher, a reflection of the favorable harvesting conditions. Alveogragh data indicate that the 1990 flours are slightly weaker than those of 1989.

19. Protein Content of 1990 Harvest Survey Canada Western Soft White Spring Wheat

	Protein Content (%)*		
Grade	1990	1989	1988
No. 1 CWSWS	10.8	10.9	11.0
No. 2 CWSWS	11.1	11.0	11.5
No. 3 CWSWS	11.3	11.2	11.4
CW Feed	11.0	11.1	10.8
All Grades	**10.9**	**11.0**	**11.1**

* N x 5.7; 13.5% moisture content basis.

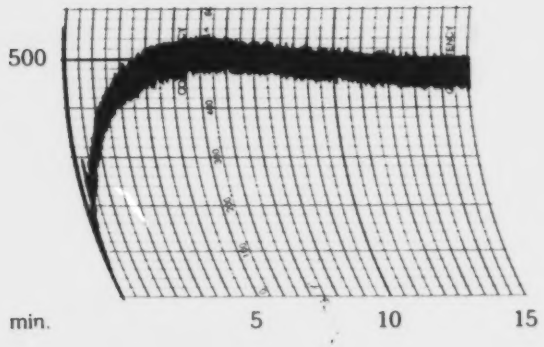
20. CANADA WESTERN SOFT WHITE SPRING WHEAT
Quality Data for 1990 Harvest Survey Grade Composite Samples

Quality Parameter	1990		1989	
	No. 1 CWSWS	No. 2 CWSWS	No. 1 CWSWS	No. 2 CWSWS
WHEAT				
Test Weight, kg/hL	81.7	80.6	80.5	79.8
Weight per 1000 Kernels, g	36.2	35.4	34.7	35.7
Protein Content, % (N x 5.7)	10.9	11.2	11.0	11.0
Ash Content, %	1.48	1.59	1.51	1.48
Alpha-amylase Activity, units/g	7.5	22.4	19.7	65.3
Falling Number, s	355	290	280	165
Particle Size Index, %	67.1	67.2	69.3	69.1
Flour Yield, %	74.0	73.3	72.2	73.5
FLOUR				
Protein Content, %	9.8	10.1	9.6	9.6
Wet Gluten Content, %	28.9	32.6	32.2	37.1
Ash Content, %	0.46	0.46	0.41	0.42
Color, units	-0.2	-0.2	-0.5	0.4
Starch Damage, Farrand units	8	8	8	8
Alpha-amylase Activity, units/g	2.0	6.1	7.9	24.2
Amylograph Peak Viscosity, BU	810	470	525	170
Maltose Value, g/100 g	1.0	1.1	1.1	1.5
FARINOGRAM				
Absorption, %	55.3	55.1	54.4	54.5
Development Time, min	1.25	1.25	1.25	1.25
Mixing Tolerance Index, BU	185	200	170	180
Stability, min	1.50	1.00	1.25	1.50
ALVEOGRAM				
Length, mm	142	137	170	173
P (height x 1.1), mm	23	22	25	23
W, x 10^3 ergs	33	38	55	50

Figure 5. Farinograms of 1990 Crop Composite Samples

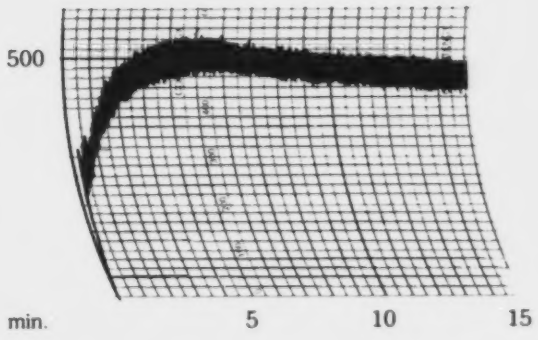
No. 1 Canada Western 14.5 Red Spring Wheat

Eastern Prairie



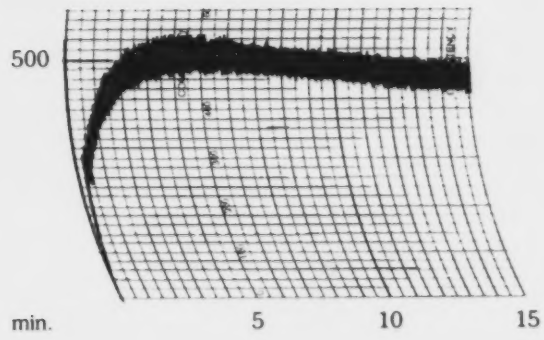
No. 1 Canada Western 14.5 Red Spring Wheat

Western Prairie



No. 1 Canada Western 13.5 Red Spring Wheat

Eastern Prairie



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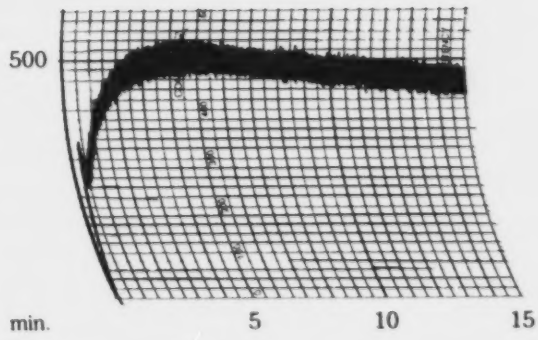
Western Prairie



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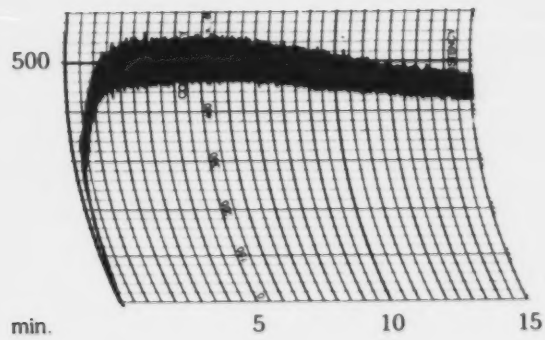
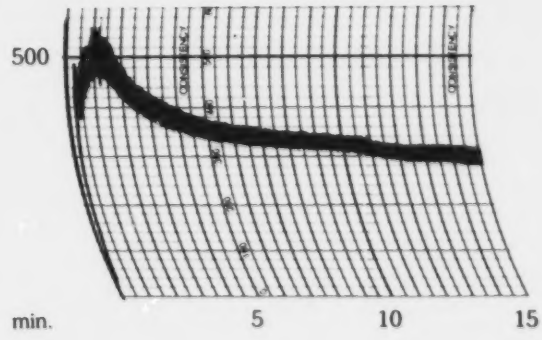


No. 1 Canada Western Soft White Spring Wheat



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Methods

Notes on the methods used at the Grain Research Laboratory are given below. Unless otherwise specified, analytical results for wheat are reported on a 13.5% moisture basis and for flour on a 14.0% moisture basis. The AACC methods cited are those of the American Association of Cereal Chemists given in *Cereal Laboratory Methods*, Eighth Edition, 1983. The ICC methods are those of the International Association for Cereal Science and Technology.

Test Weight is determined using the Schopper Chondrometer equipped with the 1 litre container. The weight in grams of the measured litre of wheat is divided by 10 and the result is reported on an "as is" moisture content basis.

Weight per Thousand Kernels. Broken kernels and foreign material are first removed from a sample by hand-picking. The number of kernels in a 20 g sub-sample of this cleaned material is then counted using an electronic seed counter.

Protein Content (N x 5.7) is determined by the Kjeldahl method as modified by Williams, "Journal of the Science of Food and Agriculture" 24:343, 1973.

Alpha-amylase Activity of wheat and of flour is determined by the method of Kruger and Tipples, "Cereal Chemistry" 58:271-274, 1981.

Falling Number is determined on a 7 g sample of ground wheat by the method of Hagberg, "Cereal Chemistry" 38:202-203, 1961. Wheat (300 g) is ground in a Falling Number Laboratory Mill 3100 (ICC Standard Method No. 107). Results are reported on a 14.0% moisture content basis.

Particle Size Index (PSI) is determined according to Williams and Sobering, "Cereal Foods World" 31:417-420, 1986. PSI is an indication of the relative kernel texture (hardness or softness) of different wheat types. Soft wheats give high PSI values of 65 to 75; durum wheats give low values of 35 to 45; and all other wheat types give intermediate values.

Milling (flour). Wheat is cleaned, scoured and tempered overnight to optimum moisture as described by Dexter and Tipples, "Milling" 180(7):16, 1987. Milling of common wheat is then carried out in an Allis-Chalmers laboratory mill using the GRL sifter flow as described by Black *et al*, "Cereal Foods World" 25:757-760, 1980. Flour yield is expressed as a percentage of cleaned wheat on a constant moisture basis, and for CWRS wheat, is also expressed on a constant ash content basis and constant flour color grade basis computed as described by Dexter and Tipples, "Milling" 182(8):9-11, 1989. Pilot milling (flour) is carried out as described by Black, "Bulletin - Association of Operative Millers", 3834, 1980.

Wet Gluten Content. The ICC Standard Method No. 137 is followed using the "Glutomatic" System.

Ash Content is determined on a 4 g sample in a silica dish incinerated overnight at 600°C. After cooling, the dish plus ash are weighed, the ash brushed out, the dish reweighed, and the weight of ash determined by difference.

Flour Color. A color index is obtained using the automated Simon Series IV Flour Color Grader which gives the relative reflectance of a flour-water slurry. Results are reported as arbitrary scale units; the lower the number, the brighter the color.

Starch Damage is determined on a 5 g sample by the method of Farrand, "Cereal Chemistry" 41:98-111, 1964.

Amylogram. Sixty-five grams of flour (14.0% moisture content basis) and 450 mL distilled water are used with the Brabender Amylograph and the pin stirrer; other details are as in AACC Method 22-10. Peak viscosity is reported in Brabender units.

Maltose Value is determined according to AACC Method 22-16.

Baking is carried out by the Remix baking test procedure of Irvine and McMullan, "Cereal Chemistry" 37:603-613, 1960, as described in detail by Kilborn and Tipples, "Cereal Foods World" 26:624-628, 1981. Remix-to-peak is a modification in which dough is mixed to optimum (peak) consistency at the second mixing stage.

Farinogram. Fifty grams of flour (14.0% moisture content basis) are mixed in a small stainless steel farinograph bowl (63 r.p.m. drive) for 15 min. with sufficient distilled water to give a maximum dough

consistency centered about the 500 Brabender Unit line. Farinograph absortpion is the amount of water which must be added to a flour of 14.0% moisture content to give the required consistency, and is reported as percent. Dough development time is the time required for the curve to reach its maximum height. For additional details, see the *Farinograph Handbook*, AACC, 1960.

Extensigram. Doughs are made from 300 g flour (14.0% moisture content basis), 6 g salt, and distilled water equal to the farinograph absorption less 2.0 percentage units to compensate both for the salt and for the substitution of the large stainless steel farinograph bowl. Doughs are mixed for 1 min., rested for 5 min., and mixing is then continued until the curve is centered about the 500 Brabender Unit line. Curves are drawn for duplicate doughs at 45 and at 135 min. though doughs are also rounded and shaped at 90 min. Average curves for 45 and 135 min. are reproduced, but measurements (length in centimeters, height in Brabender Units, and area in square centimeters) are reported only for the 135 min. curve (solid line). The Extensigraph is set so that 100 Brabender Units equal a 100 g load.

Alveogram. The ICC Standard Method No. 121 is followed, using the constant pressure Model MA82 instrument.

Supplementary Baking Tests. The Sponge-and Dough method (4.5 hr. 70% sponge) is carried out as described by Kilborn and Preston, "Cereal Chemistry" 58:198-201, 1981. The Canadian Short Process method is carried out as described by Preston *et al*, "Canadian Institiute of Food Science and Technology Journal" 15:29-36, 1982. For both methods loaves are produced from 200 g of flour in baking pans that have cross-section dimensions similar to those of Canadian commercial baking pans. Preliminary baking tests are carried out to determine optimum oxidation requirements.

Vitreous Kernels. This determination is made by the Grain Inspection Division on a 25 g sample of clean wheat. The vitreous kernels are handpicked and weighed.

SDS Sedimentation values are determined by the method of Axford and Redman, "Cereal Chemistry" 56:582 (1979), using 3% SDS.

Milling (semolina). Wheat is cleaned, scoured and tempered overnight to 16.5% moisture as described by Dexter and Tipples, "Milling" 180(7):16, 1987. An Allis-Chalmers mill in conjunction with a laboratory purifier (Black, "Cereal Science Today" 11:533, 1966) is used for milling as described by Dexter *et al*, "Cereal Chemistry" 67:405, 1990. Milling yield (including flour) and semolina yield (less than 1% through a 149 micron sieve) are reported, on a constant moisture basis, as a percentage of the cleaned wheat. The millroom is controlled for temperature (22°C) and humidity (60%).

Semolina Color is determined according to AACC Method 14-30. An AGTRON direct reading reflectance spectrophotometer is used.

Speck Count is determined as described by Dexter and Matsuo, "Cereal Chemistry" 59:63 (1982).

Spaghetti is processed from semolina on a DEMACO laboratory-scale continuous extrusion press as described by Matsuo *et al* "Cereal Chemistry" 55:744 (1978) and dried both by a conventional low-temperature drying cycle (39°C) and by a high-temperature cycle (70°C) as described by Dexter *et al* "Journal of Food Science" 46:1741 (1981).

Spaghetti Color. Whole strands of spaghetti are mounted on white cardboard for color measurements. Dominant wavelength, purity and brightness are determined, using the Ten Selected Ordinates method, with a Beckman DU-7 Spectrophotometer.

Spaghetti Cooking Quality is determined according to the method of Dexter and Matsuo, "Canadian Journal of Plant Science" 57:717-727, 1977.

Stickiness of Cooked Spaghetti is measured on the GRL Compression Tester as described by Dexter *et al*, "Cereal Chemistry" 60:139, 1983.

Cooking Loss, the amount of material lost in the cooking water, is determined as described by Dexter and Matsuo, "Cereal Chemistry" 56:394, 1979.

Farinogram (semolina). Fifty grams of semolina (14.0% moisture content basis) is mixed with distilled water (31.5% absorption) in the small stainless steel farinograph bowl (59 r.p.m. drive), using the rear sensitivity setting.

Collection of Samples. Samples are obtained from grain companies operating primary elevators in Western Canada. The grade composites of Red Spring Wheat are prepared by using samples from Manitoba and the eastern half of Saskatchewan for the Eastern Prairie composites and from Alberta and the western half of Saskatchewan for the Western prairie composites. Samples collected up to and including the following dates were used:

September 19	- No. 1, 2 & 3 CW Red Winter Wheat
September 21	- No. 1 CW Red Spring Wheat • Eastern Prairie
September 26	- No. 2 CW Red Spring Wheat • Eastern Prairie
September 27	- No. 1, 2, 3 & 4 CW Amber Durum Wheat
September 28	- No. 1 CW Red Spring Wheat • Western Prairie
October 2	- No. 2 CW Red Spring Wheat • Western Prairie
	- No. 3 CW Red Spring Wheat • Eastern and Western Prairie
October 3	- No. 1 CW Canada Western Utility Wheat
October 4	- No. 1 & 2 CW Soft White Spring Wheat

Acknowledgements

The Grain Research Laboratory acknowledges the cooperation of the grain companies and their primary elevator managers for providing samples. The Laboratory also acknowledges the assistance of the Winnipeg Office of the Grain Inspection Division, Canadian Grain Commission, and Mr. Peter Edwards, Chairman, Grain Appeal Tribunal of the Canadian Grain Commission in grading all harvest survey samples. The assistance of the Weather and Crop Surveillance Unit of the Canadian Wheat Board in providing the weather and crop condition and harvesting reviews is also gratefully acknowledged.

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